



## Predictors of successfully quitting smoking among smokers registered at the quit smoking clinic at a public hospital in northeastern Malaysia

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### Abstract

**Objective:** The objectives of this study were to determine the proportion of smokers registered at the quit smoking clinic at a public hospital in northeastern Malaysia who successfully quit smoking and the predictive factors for successfully quitting smoking.

**Methods:** This was a cross-sectional study involving smokers aged more than 18 years old and registered with the clinic from January 1, 2012, to October 31, 2014. Data were obtained with a designed questionnaire that consisted of sociodemographic information, medical history, smoking characteristics, and type of treatment received by smokers. Smokers who quit smoking 6 months after being registered at the quit smoking clinic were considered as successful quitters. Multiple logistic regression was applied to determine the predictive factors for successfully quitting smoking.

**Results:** From a total of 202 respondents, 42.6% [95% confidence interval (CI) 35.8–49.4%] of them successfully quit smoking. Multiple logistic regression showed that the number of cigarettes smoked per day (adjusted odds ratio 2.51, 95% CI 1.17–5.41) and a previous quit attempt (adjusted odds ratio 1.88, 95% CI 1.03–3.44) were significant predictors for successfully quitting smoking.

**Conclusion:** This study shows that the proportion of smokers who successfully quit smoking among smokers registered at the quit smoking clinic was relatively high. A number of cigarettes smoked per day of 20 or fewer and a previous quit attempt significantly predict successful quitting of smoking.

**Keywords:** Proportion; predictors; quit smoking

**Significance statement:** Cigarette smoking is one of the risk factors leading to noncommunicable diseases such as cardiovascular and respiratory system diseases and cancer. Quitting smoking is difficult for many people and may involve multiple attempts. A quit smoking clinic is designed to assist smokers with tobacco dependence to quit smoking. There are many factors that contribute to successfully quitting smoking. The present study found that from a total of 202 respondents who attended the clinic, 42.6% of them successfully quit smoking. In addition, the number of cigarettes smoked per day and a previous quit attempt were significant predictors for successfully quitting smoking. These findings should be taken into consideration in interventions for smokers who wish to quit smoking.

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## Introduction

Cigarette smoking is one of the risk factors leading to non-communicable diseases such as cardiovascular and respiratory system diseases and cancer. The global estimate of smokers is expected to increase to 1.6 billion by 2025, and the number of deaths due to smoking-related diseases is expected to reach 8.3 million by 2030 [1]. Based on National Health and Morbidity Survey in 2006, the prevalence of adult smokers among males in Malaysia was 46.4% [2].

Quitting smoking is difficult for many people and it may involve multiple attempts. In Malaysia, a comprehensive tobacco control program, the National Tobacco Control Program, has existed since 1993 and it includes the National Quit Smoking Program [3]. A quit smoking clinic is one of the programs listed in the National Quit Smoking Program to help smokers quit smoking [4]. A quit smoking clinic is designed to assist smokers with tobacco dependence to quit smoking through proven techniques such as behavioral modifications and pharmacotherapy such as nicotine replacement therapy. However, the number of smokers still shows an increasing trend despite all the implementations.

The proportion of smokers who successfully quit smoking differs between countries. There are many factors that contribute to successfully quitting smoking, such as sociodemographic factors (age, sex, marital status, employment, education), the presence of medical problems, smoking characteristics, type of treatment received, environmental factors, alcohol consumption, self-efficacy, and motivational level. It was found that smoking fewer cigarettes per day, higher levels of self-efficacy, and more immediate quitting intentions predict successful quitting of smoking in Malaysia and Thailand [5].

The rates of quitting smoking have remained stagnant worldwide [6]. There are three common barriers to successfully quitting smoking; namely, stress management, lack of support to quit from health professionals and other service providers, and high prevalence and acceptability of smoking within communities [7].

Hence it is important to understand the factors that predict successful quitting of smoking in specific cultural and socioeconomic settings. This is to provide appropriate support to smokers in their efforts to quit smoking. Thus this study was conducted to determine the proportion of smokers who

successfully quit smoking in northeastern Malaysia and the predictive factors for successfully quitting smoking.

## Methodology

### *Study design and data collection*

A cross-sectional study was conducted in a quit smoking clinic at a public hospital in northeastern Malaysia. We included adult smokers (aged more than 18 years old) who registered with the quit smoking clinic from January 1, 2012, to October 31, 2014. The quit smoking clinic is run by three medical officers, a health education officer, and a well-trained nurse. The clinic receives referrals from all departments in the public hospital as well as from other health clinics. It also receives walk-in patients and operates daily during working hours.

During the first visit, the smokers were required to make a vow to quit smoking and determine their quit date. Then information on their sociodemographic characteristics, medical history, and smoking characteristics were obtained. The Fagerström test for nicotine dependence, measurement of vital signs, and anthropometric measurements were performed, followed by a thorough physical examination of those smokers.

Subsequent follow-up visits were scheduled weekly for the first month and fortnightly for the second and third months, and later the visits were once a month until the sixth month. The treatment offered could be nonpharmacological (counseling), pharmacological, or a combination of both. Pharmacological treatment was offered to smokers with a Fagerström score of 4 or more.

In this study, the age of starting smoking was grouped into before 20 years and 20 years or older [8]. The number of cigarettes smoked per day was categorized into fewer than 20 and 20 or more [8]. The previous duration for quitting smoking was grouped into less than 6 months and 6 months or more [9]. The Fagerström score was grouped into minimally dependent (0–3), moderately dependent (4–6), and highly dependent (7–10). Smokers who quit smoking for at least 6 months after being registered at the quit smoking clinic were considered as successful quitters [10].

### *Statistical analyses*

Data were entered into and analyzed with IBM SPSS Statistics version 22. Categorical variables were summarized into



## Predictors of successfully quitting smoking among smokers registered at the quit smoking clinic

numbers and percentages. Numerical variables were expressed as the mean and standard deviation. Multiple logistic regression analysis was performed to determine predictive factors for successfully quitting smoking. In the analysis the preliminary main effect model was obtained after comparison of the model with use of forward and backward logistic regression methods. Multicollinearity was checked with use of the correlation matrix and variance inflation factor. A variance inflation factor of less than 10 was acceptable and indicated that there was no multicollinearity problem. All possible two-way interactions were also checked. The fitness of the model was tested with the Hosmer-Lemeshow goodness-of-fit test, the classification table, and the area under the receiver operating characteristic curve.  $P < 0.05$  was judged to be statistically significant.

### Ethics consideration

The study was approved by the Malaysian Medical Research and Ethics Committee [NMRR-14-1671-23628(IIR)] and the Human Research Ethics Committee, Universiti Sains Malaysia (USM/JEPeM/14120513). Confidentiality was kept throughout the study by use of an anonymization technique so that only researchers were able to access personal details of the smokers.

### Results

A total of 202 male smokers were selected for the study. Most of them were Malay Muslims (98.5%) and married (79.2%), with a mean (SD) age of 45.4 (12.75) years. Among the smokers, the youngest was 19 years old and the oldest was 72 years old. Most of the workers were employed (82.2%) and had medical illnesses (83.2%). Most of them started smoking below the age of 20 years (78.2%) and smoked more than 20 cigarettes per day (79.7%) at the first visit. On the Fagerström test, 49.5% of them were found to be moderately or highly dependent. There was an equal distribution of smokers who received counseling therapy only and those who received both counseling and pharmacological treatment. Table 1 shows the characteristics of the smokers registered at the quit smoking clinic.

The proportion of smokers who successfully quit smoking was 42.6% [95% confidence interval (CI) 35.8–49.4%]. From multiple logistic regression analysis, the number of cigarettes

Table 1. Characteristics of the smokers registered at the quit smoking clinic ( $n=202$ )

Variable	Number
Level of education	
Up to primary school	33 (16.4%)
Completed secondary school	135 (66.8%)
Tertiary education	34 (16.8%)
Employment status	
Unemployed	36 (17.8%)
Employed	166 (82.2%)
Medical illness	
Yes	168 (83.2%)
No	34 (16.8%)
Age at which started smoking (years)	
<20	158 (78.2%)
≥20	44 (21.8%)
Number of cigarettes smoked per day	
≤20	41 (20.3%)
>20	161 (79.7%)
Result of Fagerström test of nicotine dependence	
Minimally dependent	102 (50.5%)
Moderately dependent	71 (35.1%)
Highly dependent	29 (14.4%)
Previous quit smoking attempt	
Yes	128 (63.4%)
No	74 (36.6%)
Previous quit smoking duration ( $n=128$ )	
<6 months	106 (82.8%)
≥6 months	22 (17.2%)

smoked per day (adjusted odds ratio 2.51, 95% CI 1.17–5.41) and a previous quit attempt (adjusted odds ratio 1.88, 95% CI 1.03–3.44) were significantly associated with successfully quitting smoking. Table 2 shows the predictive factors for successfully quitting smoking among smokers registered at the quit smoking clinic obtained by multiple logistic regression analyses.

### Discussion

The proportion of smokers registered at the quit smoking clinic who successfully quit smoking was about 43%. This finding is similar to that of a study done in the Tanglin Quit Smoking Clinic, Kuala Lumpur, which was 40% [11]. However, the



Table 2. Factors associated with successfully quitting smoking among smokers registered at the quit smoking clinic obtained by simple and multiple logistic regression analyses ( $n=202$ )

Variable	Crude OR <sup>a,b</sup>	Adjusted OR <sup>b,c</sup>	Wald statistic <sup>d</sup>	P-value
Previous quit attempt				
No (74, 36.6%)	1.00	1.00	4.22 (1)	0.040
Yes (128, 63.4%)	1.78 (0.99–3.23)	1.88 (1.03–3.44)		
Numbers of cigarettes smoked per day				
>20 (161, 79.7%)	1.00	1.00	5.56 (1)	0.018
≤20 (41, 20.3%)	2.38 (1.12–5.07)	2.51 (1.17–5.41)		

OR, odds ratio.

<sup>a</sup>Simple logistic regression.

<sup>b</sup>The 95% confidence interval is given in parentheses.

<sup>c</sup>Multiple logistic regression.

<sup>d</sup>The number of degrees of freedom is given in parentheses.

proportion of smokers who successfully quit smoking among 1224 smokers registered at a quit smoking clinic in the United Kingdom was lower, about 36% [12]. The higher proportion of smokers who successfully quit smoking in the present study might be due to the high rate of attendance of older smokers at the quit smoking clinic. Most of them also had various medical problems for which they were required and advised by medical personnel to quit smoking. Furthermore, about half of the smokers were minimally dependent on nicotine. Hence it was much easier for them to quit smoking than for those with moderate or high dependency on nicotine.

From all the factors studied, it was found that there are two factors that predict successful quitting of smoking: the number of cigarettes smoked per day and a previous quit attempt. Smokers who smoked 20 cigarettes or fewer per day had a 2.5 times higher chance of quitting smoking than those who smoked more than 20 per day. This finding is in line with the findings of the studies by Li et al. [5] and Myung et al. [8]. Smoking fewer cigarettes per day indicates that the smoker is minimally dependent on nicotine, and hence it is easier to quit smoking.

In contrast, this finding contradicts the findings of other studies done in Korea and South Africa. In Korea, two studies found that smokers who smoked 20 or more cigarettes per day were more likely to succeed in quitting smoking than those who smoked fewer than 20 cigarettes per day [6, 13]. A study

in South Africa also demonstrated that smoking a larger number of cigarettes per day was associated with higher success in quitting smoking. This can be explained by the fact that heavy smokers experience more smoking-related adverse health conditions. Hence they are more motivated to quit smoking than their counterparts, who may not perceive smoking as a threat to their health and therefore were not motivated to quit smoking [14].

The second factor that is significantly associated with successfully quitting smoking is a previous quit attempt. It was shown by Caponnetto and Polosa [15] that a previous quit attempt is an indicator for successfully quitting smoking in both adults and adolescents. In the present study, those who had previously attempted to quit smoking were almost twice as likely to successfully quit smoking than those who had never attempted to quit smoking before. This finding is supported by the findings of many studies conducted in other countries. A study among the Japanese population [16] and a study in the United Kingdom [17] also demonstrated that previous attempts to quit smoking are associated with successful smoking cessation. On the other hand, a study among Japanese smokers demonstrated that the relapse rate increased with previous attempts to quit smoking [18].

The present study found that age was not a predictor for successfully quitting smoking among the population studied. In contrast, many studies have found that older age is



## Predictors of successfully quitting smoking among smokers registered at the quit smoking clinic

associated with successfully quitting smoking [6, 13, 19]. Older people usually have medical problems such as cardiovascular and lung diseases that motivate them to quit smoking. On the other hand, a prospective cohort study conducted in Australia, Canada, the United Kingdom, and the United States showed that younger people (18–24 years of age) had higher rates of smoking cessation [20].

It was shown that support from a spouse plays a significant role in predicting successful quitting of smoking. For example, studies in South Korea found that married smokers were more likely to quit smoking than unmarried smokers [6, 13]. However, the present study found no relationship between marital status and successfully quitting smoking.

Among the limitations of the study is the recall bias due to the smokers when answering questions about their smoking history, such as the age at which they started smoking and the number of cigarettes smoked per day. This bias undeniably affects the overall results of the study.

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### Conflict of interest

The authors declare that they have no conflict of interest.

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### Author contributions

Nur Izzati Mohammad was responsible for conceptualization, design of the study, acquisition of data, statistical analysis, and interpretation of data as well as drafting the manuscript. Selaswati Ghazali was responsible for acquisition of data and revising the manuscript critically for important intellectual content. Mohd Nazri Shafei was responsible for acquisition of data, revising the manuscript critically for important

intellectual content, adoption of reviewers' comments, revision of the manuscript, and the final draft. All authors were responsible for the final approval of the version of the manuscript to be published.

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